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Schmid

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[54] **WEB TENSIONING DEVICE**

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[52] **U.S. Cl.** **226/34**, 226/44

[51] **Int. Cl.** **B65h 25/04**

[58] **Field of Search** 226/34, 35, 44

[56] **References Cited**

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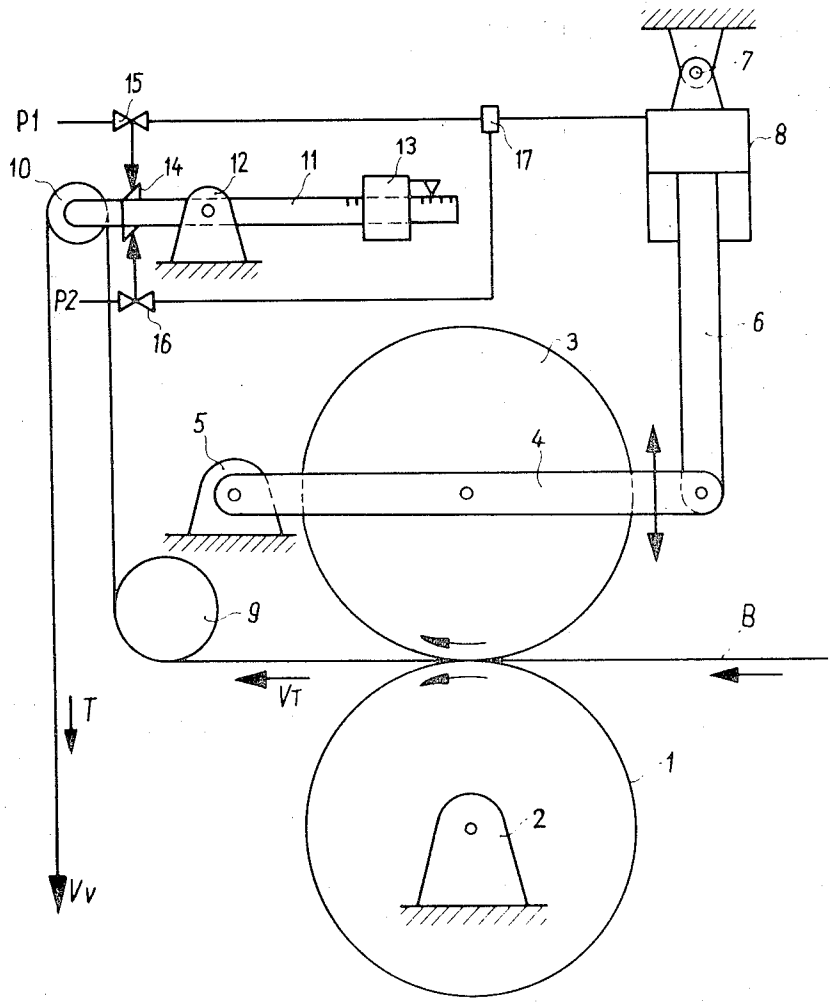
Primary Examiner—Richard A. Schacher

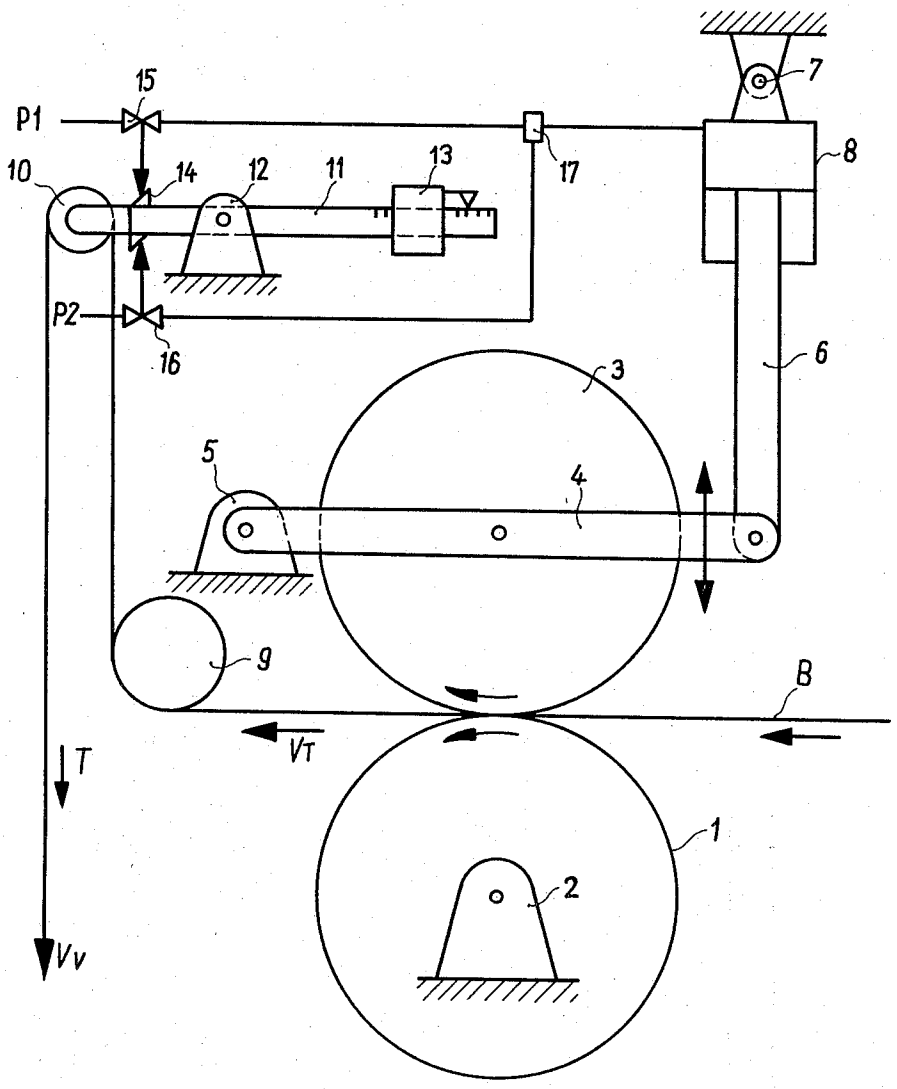
Attorney, Agent, or Firm—Toren, McGeady and Stanger

[57] **ABSTRACT**

For maintaining the tension in a web of paper or the like at a constant value, the web is passed over a measuring and storage roll mounted on one end of a lever. The lever is pivotally supported on a fixed bearing. An adjustable member is positioned on the lever for establishing the constant values of web tension. Upstream from the measuring and storage roll the web passes between a pair of feed rollers one of which is mounted in a fixed position while the other is adjustably mounted. During operation, the displacement of the measuring and storage roll is conveyed through the lever to apparatus which alternates between two pressure sources so that the position of the adjustably mounted feed roll is regulated by these pressure sources to maintain the constant value of web tension.

6 Claims, 1 Drawing Figure

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P1
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WEB TENSIONING DEVICE

SUMMARY OF THE INVENTION

The present invention is directed to a web tensioning device and, more particularly, it concerns a device for checking the web tension and maintaining it at a constant value.

There is a known device for keeping a moving web under a nominal stress value which includes a measuring member for checking the deviation from the nominal value and apparatus for varying the speed of the web in dependence on the measured value to eliminate any deviations in web tension.

Such a device involves a costly arrangement of driving and feeding rolls as well as a complicated arrangement for measuring the web tension and eliminating any deviations from the nominal value.

Another web tensioning device is disclosed in U.S. Pat. No. 2,334,164. This device, however, is confined to use on roll unwinding installations for web materials and represents a friction brake which acts on the circumference of the unwinding roll. Further, it includes a belt **29** which moves at a speed which is less than the processing speed of the material web W. Accordingly, the roller y is regulated in its speed of rotation by variable pressure via piston **42** and tension roller **31.**

A disadvantage of this device is that it is not possible to obtain a variation which is greater or smaller than the processing speed.

Therefore, the primary object of the present invention is to provide a simple and safe device requiring little maintenance which regulates the web tension at a constant value.

In the present invention, a pair of rolls are provided which are driven at a constant speed with at least one of the rolls having an elastic surface, and the rolls feed a varying amount of material depending on the pressure applied in the roll gap or bite.

The web tensioning device acts as a friction-free variable web drive, due to the special feeding properties of the pair of rolls used, with at least one of the rolls having an elastic surface coat. With the proper selection of the driving speed for the pair of rolls, the conveying speed of the feed rolls can be higher or lower than the processing speed, depending on the size of the adjustable force exerted on the rolls.

In the present invention, one of the feed rolls is fixedly mounted in a bearing and is driven so that its surface feed corresponds substantially to the processing speed of the web. The other feed roll is adjustably mounted on a lever which is pivotally mounted in a fixed bearing at one end while its other end is articulated to the piston rod of a piston assembly secured to another fixed bearing. Downstream in the direction of passage of the web from the feed rolls, a measuring and storage roll is provided for guiding the web. The measuring and storage roll is rotatably mounted on another level which is pivotally supported intermediate its ends on a bearing. An adjustable force source is positioned on the lever on the opposite side of the bearing from the roll for establishing the constant value of the web tension. Reversing elements are arranged in the path of the pivotal movement of the lever for sensing the variation of the conveying speed relative to the processing speed and, depending on the manner in which web speed varies, conveying the signal to one of a pair of

valves connected over an OR-gate to the piston assembly for adjusting the contacting relationship betweed the feed rolls.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWING

The drawing is a schematic representation of one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

As shown in the drawing, a web B of paper or the like, passes between a pair of feed rolls **1, 3.** One of the feed rolls 1 is fixedly mounted in a fixed bearing which is driven so that its surface speed corresponds substantially to the processing speed Vt of the material web B. The other one of the feed rolls is adjustably mounted on a lever **4,** intermediate the ends of the lever. One end of the lever is pivotally mounted in a fixed bearing while the other end is articulated to a piston rod **6** extending outwardly from a piston assembly **8** which is supported on a fixed bearing **7.** As the material web B moves downstream from the pair of feed rolls **1, 3,** it passes over a guide roll **9** and then around a measuring and storage roll **10.** The measuring and storage roll **10** is rotatably mounted on one end of a lever **11** which is pivotally mounted intermediate its ends on a fixed bearing **12.** An adjustable source of force **13** is positioned on the lever **11** on the opposite side of the bearing **12** from the roll **10** and the source of force positions the lever in accordance with the constant web tension. As the conveying speed varies relative to the processing speed, then the lever pivots about its bearing to indicate or sense the tendency to deviate from the constant web tension value. A reversing element **14** is provided with a slot or opening through which the lever **11** passes between the roll **10** and the bearing **12.** As shown in the drawing, a pair of valves **15, 16** are associated with the reversing member **14** each located on an opposite side of the reversing member relative to the lever. The two valves **15, 16** are connected to the piston assembly **8** over an OR-gate **17.**

The source of force **13** associated with the lever **11** can be in the form of a displaceable counterweight or a pneumatic piston. As mentioned above, the reversing member **14** forms a guide through which the lever passes so that any tendency of the web tension to depart from its constant value will cause the lever to pivot about its point of articulation on the bearing **12** so that the rods extending between the reversing member and the valves can actuate one of the valves. In place of the arrangement shown in the drawings, pneumatic units can be used.

METHOD OF OPERATION

As the web B passes over the measuring and storage roll **10** one of the valves **15, 16** is connected to the piston **8** while the other remains disconnected. If valve **15** is connected, the pressure **P1,** conveyed through the valve, acts in the piston **8** and adjusts the contact between the feed rolls **1, 3.** The pressure **P1,** conveyed

through the valve **15** is connected so that the conveying speed V*t* of the feed rolls **1, 3** is somewhat less than the processing speed V*v*. As a result, with valve **15** connected to the piston assembly **8**, the moving and storage roll, as viewed in the drawings, moves downwardly along with the lever **11** until the valve **16** is connected through the reversing member **14** and, at the same time, the valve **15** is disconnected. The pressure P2 is adjusted, as compared to the pressure **P1**, so that the speed V*t* is somewhat higher than the processing speed V*v* and the roll **10** then reverses direction and moves upwardly until valve **15** is again connected and valve **16** is disconnected.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. Web tensioning device for regulating the tension of a web of material, such as a web of paper, to a constant value, characterized in that a pair of feed rolls are disposed in contacting relationship and arranged to provide a bite through which the web can be passed, a first bearing mounted in a fixed position, one of said feed rolls fixed in said first bearing and arranged to be driven so that its surface speed corresponds substantially to the processing speed of the material web, a second bearing mounted in a fixed position, a first lever pivotally mounted on said second bearing, the other said feed roll being mounted on said first lever, a third bearing mounted in a fixed position, a piston assembly including a piston rod secured to said third bearing with said piston rod connected to said lever, a guide roll spaced from the pair of said feed rolls and arranged for the web of material to pass over said guide roll after passing through the bite formed by said feed rolls, a measuring and storage roll spaced downstream of said guide roll in the direction of movement of the web of material so that the web passes over it, a fourth bearing mounted in a fixed position, a second lever pivotally mounted on said fourth bearing, said measuring and storage roll mounted on said second lever, a member mounted on said second lever for applying an adjustable force thereto in accordance with the constant web tension value, a regulating means operatively associated with said lever and in operative communication with said piston assembly for maintaining the constant value of web tension by continuously adjusting said piston assembly which adjustment is conveyed to the other said feed roll over said first lever for maintaining the constant web tension value.

2. Web tensioning device, as set forth in claim **1**, wherein said regulating means includes a reversing member mounted on said second lever for sensing the movement of said lever about its point of pivotal connection to said second bearing, an OR-gate connected to said piston assembly, a first valve connected to said reversing member and to said OR-gate, a second valve connected to said reversing member and to said OR-gate, each of said first and second valves connected to a source of pressure at a different value, so that as the web moves over said measuring and storage roll one of said valves is connected to said piston while the other valve is disconnected causing said measuring and storage roll to reverse its direction of movement for connecting the disconnected valve and disconnecting the other valve for maintaining the constant web tension value.

3. Web tensioning device, as set forth in claim **2**, wherein said reversing member comprises a guide member having a slot through which said lever extends and relative to which said lever is displaceable in accordance with the web tension exerted on the measuring and storage roll, a pair of rods secured to said guide member each on an opposite side of said lever in the direction in which the lever is pivotally displaceable, each of said rods connected to a different one of said valves for alternately operating said valves in accordance with the movement of said measuring and storage roll mounted on said second lever.

4. Web tensioning device, as set forth in claim **2**, wherein said guide member and rods are pneumatic units.

5. A web tensioning device, as set forth in claim **1**, wherein said adjustable member is a displaceable counterweight mounted on said second lever.

6. Web tensioning device, as set forth in claim **1**, wherein said adjustable member is a pneumatic piston connected to said second lever.

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